

PROJECT NUMBER: 1702
PROJECT TITLE: Optical Processing and Aerosol Research
PROJECT LEADER: K. A. Cox
PERIOD COVERED: May, 1990

I. PACK INSPECTION SYSTEM

- A. Objective:** Develop and implement an on-line cigarette pack inspection system.
- B. Results:** An advisory group, chaired by Miles Waugh, was assembled to review the design of OSIRIS, the factory prototype pack inspection system. The advisory group members represent Manufacturing, Quality Engineering, Engineering Applied Technology, Engineering Manufacturing and Quality Audit. A document describing the operational concepts of the pack inspection system was completed and distributed to the members of the advisory group. The group was later convened and a description of the features and operation of OSIRIS provided. The comments from the group members were very valuable. Modifications have been made to the software design to incorporate a number of the suggestions. The group will continue to meet periodically throughout the development period.

A search is underway to identify a business partner to serve as a vendor for OSIRIS. The vendor will be expected to manufacture, support and sustain an ongoing development effort to maintain OSIRIS at the state-of-the-art. A meeting was held with representatives from Modicon, Inc., to discuss the possibility of their assuming this role. Similar meetings are being scheduled with additional candidates.

- C. Plans:** Identify a vendor for OSIRIS. Complete the software design and begin coding.
- E. References:** Miles Waugh, OSIRIS Advisory Group Meeting, memo to R. Davidson, C. Irving and E. Richardson, May 14, 1990.

II. PACKAGE BLANK INSPECTION SYSTEM

- A. Objective:** Develop an off-line inspection system for the high resolution comparison of package blanks with the corresponding master artwork.

- B. **Results:** The package blank inspection system was installed in the QA Department in the middle of March. The system has been performing well but has required more time per inspection than is desired. During this past month, the software was modified to decrease the inspection time from 3 minutes and 45 seconds to 2 minutes and 45 seconds.
- C. **Plans:** Identify commercial imaging systems supported on a Micro Vax or a PC that can be used to replace the current Sun-Androx implementation.

III. PRINT WEB INSPECTION

- A. **Objective:** Develop a system for the global inspection of print web on the printing press.
- B. **Results:** A simple algorithm was proposed for the global inspection of print web. The algorithm differs from that currently used for the inspection of cigarette packs. It takes advantage of the reduced image distortion and provides the needed capability for the detection of much smaller defects.

A meeting was held with representatives from Mercury Computer Systems, Inc., (MCS) to discuss implementation of the inspection using their hardware. The MCS hardware was found to be poorly suited to the application. We are continuing to evaluate alternative solutions based upon commercial hardware. Keeping the system affordable is presently a major concern.

- C. **Plans:** Complete the survey of currently available technology for web inspection and formulate a development plan.

IV. AEROSOL RESEARCH

- A. **Objective:** Generalize the technique for measuring the size distribution of aerosols to take into account absorption.
- B. **Results:** Our current method for the determination of the particle size distribution of the cigarette smoke aerosol is based upon spectral extinction measurements. In using this method, it is assumed that the absorption of the aerosol particles is negligible and can be neglected relative to the scattering contribution to extinction. This assumption was necessary due to our lack of knowledge of the

absorption characteristics of tobacco smoke over the wavelength range from 400-900 nanometers. We have recently carried out accurate measurements of the absorption coefficient of tobacco smoke over this wavelength range. During this past month, the method for obtaining the particle size distribution from the spectral extinction measurements has been generalized to take into account the absorption. The effect has been found to be small for cigarette smoke particles at wavelengths above 450 nanometers. However, taking into account absorption will be important in allowing us to consider shorter wavelengths and smaller particles.